



Title: Electromagnetic wave protective underwear

Claims:

1. An electromagnetic wave protective underwear characterized by being produced as follows:

- (a) preparing two electroconductive threads with a given diameter, wherein the waddings have been coated with electroconductive substance;
- (b) forming a loop on a top surface by one of the electroconductive thread, wherein the loop passes from a back side to a top surface;
- (c) forming a loop on the back side by another electroconductive thread, wherein the loop passes from the top surface to the back side;
- (d) crossing said first and second electroconductive threads halfway;
- (e) forming a loop on the top surface by said second electroconductive thread, wherein the loop passes from the back side to the top surface;
- (f) forming a loop on the back side by said first electroconductive thread, wherein the loop passes from the top surface to the back side;
- (g) repeating these steps (b) – (f) until a given width to give a first row;

next, regarding rows,

- (h) forming a loop on the top surface by passing said second electroconductive thread of said first row through the loop of said first electroconductive thread from the back side to the top surface;
- (i) forming a loop on the back side by passing said first electroconductive thread of said first row through the loop of said second electroconductive thread from the top surface to the back side;

- (j) crossing said first and second electroconductive threads;
- (k) forming a loop on the top surface by passing the first electroconductive thread through the loop of the second electroconductive thread of said first row from the back side to the top surface;
- (l) forming a loop on the top surface by passing said second electroconductive thread through the loop of said first electroconductive thread of said first row from the back side to the top surface;
- (m) repeating steps (h)-(l) until a given width to give a second row;
- (n) repeating step (m) until given rows to produce a knitted electromagnetic wave protective fabric;
- (o) knitting open parts in rib stitch; and
- (p) cutting out and sewing the fabric.

2. The electromagnetic wave protective underwear according to Claim 1, characterized in that the electromagnetic wave protective fabric is produced by being knitted as follows:

- (a) forming a loop from the back side to the top surface by said electroconductive thread, then forming a loop passing from the top surface to the back side;
- (b) forming these loops from the back side to the top surface and from the top surface to the back side by turns;
- (c) repeating step (b) until a given width to give a first row;

next, regarding rows,

- (d) forming a loop from the back side to the top surface through the loop formed from the back side to the top surface in said first row;
- (e) forming a loop passing from the top surface to the back side

through the loop formed from the top surface to the back side in said first row;

- (f) repeating steps (d)-(e) until a given width to give a second row;
- (g) repeating step (f) until given rows.

3. The electromagnetic wave protective underwear according to Claim 1 or Claim 2, characterized in that a back fabric produced by knitting nonmetallic fiber is attached to a back side of said electromagnetic wave protective underwear.

4. The electromagnetic wave protective underwear according to Claim 1 or Claim 2, characterized in that an electroconductive thread to form said electromagnetic wave protective underwear consists of said wadding and a thread-like electroconductive substance.

5. The electromagnetic wave protective underwear according to Claim 1 or Claim 2, characterized in that an electroconductive thread to form said electromagnetic wave protective underwear is formed by spirally winding said wadding with a thread-like electroconductive substance.

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(73) 実用新案権者 596145503

ファースト商事株式会社

東京都台東区烏越2丁目7番地14号

(72) 考案者 松岡 典裕

東京都台東区烏越2丁目7番14号 ファースト商事株式会社内

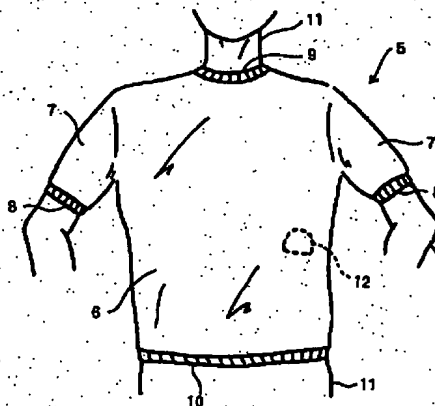
(74) 代理人 弁理士 大滝 均

(54) 【考案の名称】 電磁波防護肌着

(57) 【要約】

【課題】 本考案は、人体内に植え込まれた心臓のペースメーカーの誤作動の防止に鑑み、人体のあらゆる角度から入射する電磁波を遮断する電磁波防護肌着を提供する。

【解決手段】 本考案の電磁波防護肌着5は、芯糸2に、細線の導電性物質3を螺旋状に巻き付けた導電性糸1を肉厚で網目の詰まったスムーズ編みで電磁波遮断布4を編成し、あるいは芯糸2に、導電性物質3をコーティングした導電性糸13を、リブ編みで電磁波遮断布15を編成し、人体11が着用した際に該人体11に植え込まれたペースメーカー12が覆い包まれるように該電磁波遮断布4、15を開口部にゴム編み部分を有して裁断・縫製した。



【実用新案登録請求の範囲】

【請求項 1】 芯糸が導電性物質でコーティングされた所定径の導電性糸 2 本を、1 本目の導電性糸で表面側に裏面から表面に通るループを作り、2 本目の導電性糸で裏面側に表面から裏面に通るループを作り、さらに、前記 1 本目の導電性糸と前記 2 本目の導電性糸を途中で交差させた後、前記 2 本目の導電性糸で表面側に裏面から表面に通るループを作り、前記 1 本目の導電性糸で裏面側に表面から裏面に通るループを作り、これらを所定幅繰り返して 1 段目とし、次に段については、前記 1 段目の前記 2 本目の導電性糸で前記 1 本目の導電性糸のループに裏面から表面に前記 2 本目の導電性糸を通して表面側にループを作り、前記 1 段目の前記 1 本目の導電性糸で前記 2 本目の導電性糸のループに表面から裏面に前記 1 本目の導電性糸を通して裏面側にループを作り、さらに、前記 1 本目の導電性糸と前記 2 本目の導電性糸を交差して、前記 1 段目の 2 本目の導電性糸のループに裏面から表面に 1 本目の導電性糸を通して表面側にループを作り、つぎに前記 1 段目の前記 1 本目の導電性糸のループに裏面から表面に前記 2 本目の導電性糸を通して表面側にループを作り、これらを所定幅繰り返して 2 段目とし、これを所定段目まで繰り返して電磁波遮断布を編成し、開口部にゴム編み部を有して裁断・縫製したことを特徴とする電磁波防護肌着。

【請求項 2】 前記電磁波遮断布は、前記導電性糸で裏面から表面にループを作り、つぎに表面から裏面に通るループを作り、さらに、これら裏面から表面へのループと表面から裏面のループを交互に作り、これらを所定幅繰り返して 1 段目とし、次に段については、前記 1 段目の裏面から表面に作られたループに裏面から表面にループを作り、つぎに前記 1 段目の表面から裏面に作られたループに表面から裏面に通るループを作り、これらを所定幅繰り返して 2 段目とし、これを所定段目まで繰り返して電磁波遮断布を編成したことを特徴とする前記請求項 1 に記載の電磁波防護肌着。

【請求項 3】 前記電磁波防護肌着の裏面に、非金属性の繊維で編成した裏地を張り付けたことを特徴とする前記請求項 1 または前記請求項 2 に記載の電磁波防護肌着。

【請求項 4】 前記電磁波防護肌着を形成する導電性糸は、糸状の導電性物質を、前記芯糸と 2 本取りで成ることを特徴とする前記請求項 1 または前記請求項 2 に記載の電磁波防護肌着。

【請求項 5】 前記電磁波防護肌着を形成する導電性糸は、糸状の導電性物質を、前記芯糸に螺旋状に巻いて成ることを特徴とする前記請求項 1 または前記請求項 2 に記載の電磁波防護肌着。

【図面の簡単な説明】

【図 1】 本考案の一実施の形態に係る導電性糸の構成を示した概略構成図である。

【図 2】 本考案の一実施の形態に係る電磁波防護肌着を形成する電磁波遮断布の網目構成図である。

【図 3】 本考案の一実施の形態に係る電磁波遮断布の電磁波減衰特性（100 kHz から 1 GHz）を表したグラフである。

【図 4】 本考案の一実施の形態に係る電磁波遮断布の電磁波減衰特性（1 GHz から 2.5 MHz）を表したグラフである。

【図 5】 本考案の第二の実施の形態に係る導電性糸の構成を示した概略構成図である。

【図 6】 本考案の第二の実施の形態に係る電磁波防護肌着を形成する電磁波遮断布の網目構成図である。

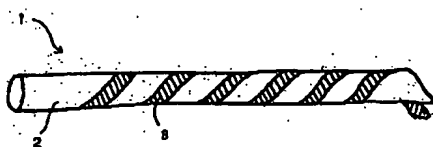
【図 7】 本考案の第二の実施の形態に係る電磁波遮断布の電磁波減衰特性を表したグラフである。

【図 8】 本考案の実施の形態に係る電磁波防護肌着を人体が着用した様子の説明図である。

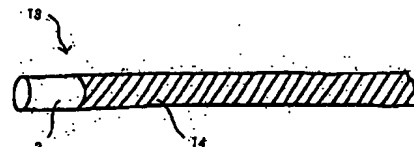
【符号の説明】

- 1、13・・・導電性糸
- 2・・・芯糸
- 3、14・・・導電性物質
- 4、15・・・電磁波遮断布
- 5・・・電磁波防護肌着
- 6・・・見頃
- 7・・・袖
- 8、9、10・・・ゴム編み部
- 11・・・人体
- 12・・・ペースメーカー

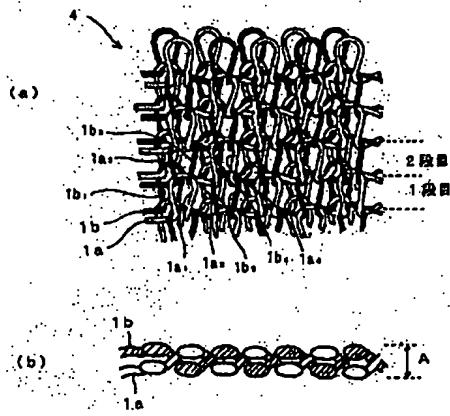
【図 1】



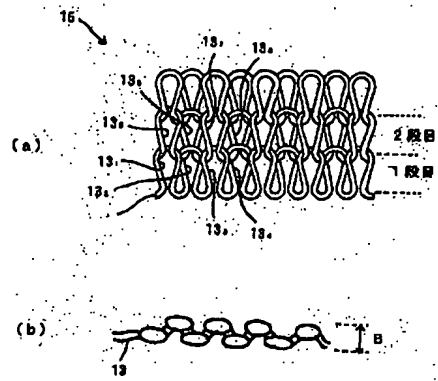
【図 5】



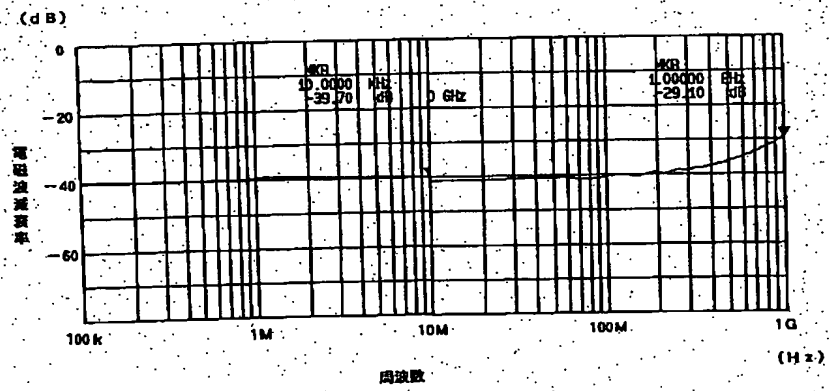
【図2】



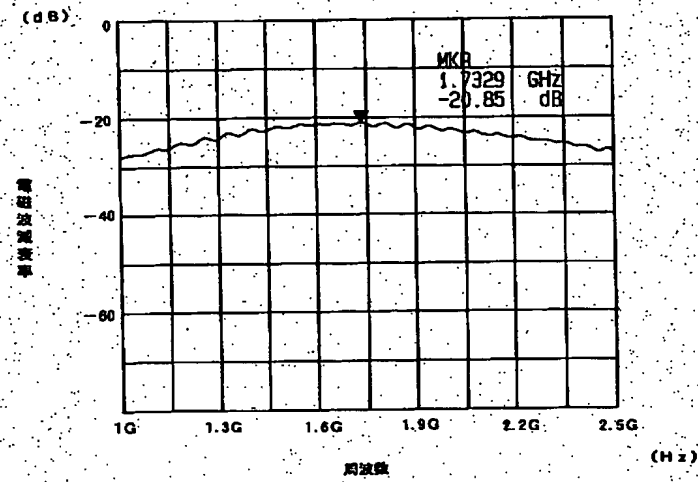
【図6】



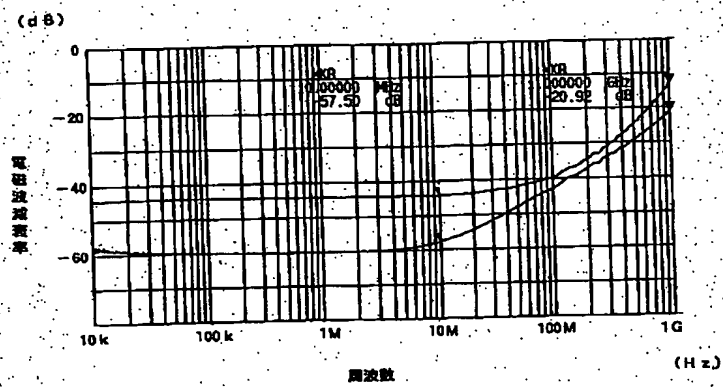
【図3】



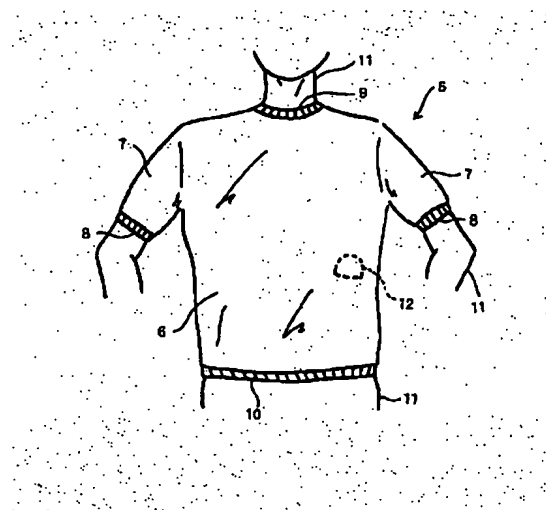
【図4】



【図7】



【図8】



【考案の詳細な説明】

【0001】

【考案の属する技術分野】

本考案は、電気製品等から発生する電磁波を遮断して、電磁波による人体への影響を防止できる電磁波防護肌着に関する。

【0002】

【従来の技術】

昨今では、電気製品からの電磁波が、人体に悪影響を及ぼしていることが報じられている。

しかしながら、このような電磁波を発する電気製品は、居住室内においては、例えば、テレビジョン、洗濯機、冷蔵庫、電子レンジ、蛍光灯等があり、現代社会での生活に必要なものとなっている。

また、多くの企業では、OA機器を導入しており、このOA機器から発せられる電磁波も、また人体に悪影響を及ぼすとして指摘されている。

さらに、このところ急激に増加した移動通信機器（以下、「携帯電話」という。）からもかなりの量の電磁波が発せられており、病院内等では、点滴器の誤作動や、停電、手術室の電子機器等の誤作動が生じるため、携帯電話の使用を制限している。

【0003】

このような、電磁波の影響を防御するために、最近では、特に、OA機器使用者用に対して、電磁波遮断エプロン等が開発され、OA機器の操作中に着用する事を奨励している。

また、電磁波を高効率で遮断する布として、裏地が開発され、スーツ等の裏地として使用されている。

この裏地は、ナイロン長繊維の周りを銀でコーティングした超導電繊維とポリエステル繊維を組み合わせた織物であり、この裏地を取り付けたスーツを着用することにより、外部からの電磁波を遮断している。

【0004】

【考案が解決しようとする課題】

しかしながら、上記したような電磁波遮断エプロンや電磁波遮断裏地を取り付けたスーツ等は、健康な人体への電磁波の防護用として開発されたものである。

ところが、心臓疾患のため、ペースメーカを植え込んだ人体への電磁波の影響は、ただ単に悪影響を及ぼすにとどまらず、このペースメーカの誤作動を引き起こし、ひいては生命の危険さえ危ぶまれることとなる。

このようなペースメーカが、外部からの電磁波を受けると、例えば、心臓の心室からの波長と間違えて、心室が順調に動作していると誤認してしまう。その結果、実際には、機能不全であるのに、ペースメーカの誤認により、一時的に心臓の機能が停止し、めまいや動悸を引き起こしてしまう。

【0005】

また、近代における高齢化にともない、高齢者の就業率も高く、前記したペースメーカを植え込んだまま、就業している人も少なくない。このような場合、周囲には、OA機器が配置され、近辺では、携帯電話が使用され、また、ペースメーカを植え込んだ本人も、これらOA機器や携帯電話を使用せざるをえなくなっている。

この携帯電話使用にあたって、先よりペースメーカに悪影響を及ぼすとして、胸ポケットに入れない。また、携帯電話使用については、ペースメーカから最低22cm離して使用するよう指導しているが、ペースメーカを植え込んだ本人が気を付ける以外に防護する方法がなく、例えば、満員電車の中で、隣の人が携帯電話を使用すると、その電磁波が、ペースメーカに影響してしまうといった問題が発生している。

【0006】

また、このペースメーカを植え込んだ人は、定期的にペースメーカの動作を記録したり、ペースメーカの電池の寿命を測定したり、また、病状に応じて設定を調整する必要がある。このとき、マグネットを用いておこなうため、ペースメーカ自体を電磁波から完全に遮断した機構にすることができない。

さらに、最近のペースメーカは、小型軽量で、電池寿命も5年～15年と長く、人体内に植え込まれて使用され、このようなペースメーカは、そのほとんどが外部から変動磁界によりプログラムの切り替えが可能なプログラマブルタイプが

用いられているため、このペースメーカーが電磁波（ノイズ）を受けると、誤ってプログラムを切り替えてしまうといった問題が発生していた。

【0007】

そこで、本考案は、人体内に植え込まれた心臓のペースメーカーの誤作動の防止に鑑み、人体のあらゆる角度から入射する電磁波を遮断する電磁波防護肌着を提供することを目的とした。

【0008】

【課題を解決するための手段】

本願請求項1に係る考案は、電磁波防護肌着において、芯糸が導電性物質でコーティングされた所定径の導電性糸2本を、1本目の導電性糸で表面側に裏面から表面に通るループを作り、2本目の導電性糸で裏面側に表面から裏面に通るループを作り、さらに、前記1本目の導電性糸と前記2本目の導電性糸を途中で交差させた後、前記2本目の導電性糸で表面側に裏面から表面に通るループを作り、前記1本目の導電性糸で裏面側に表面から裏面に通るループを作り、これらを所定幅繰り返して1段目とし、次に段については、前記1段目の前記2本目の導電性糸で前記1本目の導電性糸のループに裏面から表面に前記2本目の導電性糸を通して表面側にループを作り、前記1段目の前記1本目の導電性糸で前記2本目の導電性糸のループに表面から裏面に前記1本目の導電性糸を通して裏面側にループを作り、さらに、前記1本目の導電性糸と前記2本目の導電性糸を交差して、前記1段目の2本目の導電性糸のループに裏面から表面に1本目の導電性糸を通して表面側にループを作り、つぎに前記1段目の前記1本目の導電性糸のループに裏面から表面に前記2本目の導電性糸を通して表面側にループを作り、これらを所定幅繰り返して2段目とし、これを所定段目まで繰り返して電磁波遮断布を編成し、開口部にゴム編み部を有して裁断・縫製したことを特徴とする。

また、本願請求項2に係る考案は、前記請求項1に記載の電磁波防護肌着において、前記電磁波遮断布は、前記導電性糸で裏面から表面にループを作り、つぎに表面から裏面に通るループを作り、さらに、これら裏面から表面へのループと表面から裏面のループを交互に作り、これらを所定幅繰り返して1段目とし、次に段については、前記1段目の裏面から表面に作られたループに裏面から表面に

ループを作り、つぎに前記1段目の表面から裏面に作られたループに表面から裏面に通るループを作り、これらを所定幅繰り返して2段目とし、これを所定段目まで繰り返して電磁波遮断布を編成したことを特徴とする。

さらに、本願請求項3に係る考案は、前記請求項1または前記請求項2に記載の電磁波防護肌着において、前記電磁波防護肌着の裏面に、非金属性の繊維で編成した裏地を張り付けたことを特徴とする。

そして、本願請求項4に係る考案は、前記請求項1または前記請求項2に記載の電磁波防護肌着において、前記電磁波防護肌着を形成する導電性糸は、糸状の導電性物質を、前記芯糸と2本取りで成ることを特徴とする。

また、本願請求項5に係る考案は、前記請求項1または前記請求項2に記載の電磁波防護肌着において、前記電磁波防護肌着を形成する導電性糸は、糸状の導電性物質を、前記芯糸に螺旋状に巻いて成ることを特徴とする。

【0009】

【考案の実施の形態】

以下、本考案に係る電磁波防護肌着の一実施の形態について、図面を参照して詳細に説明する。

最初に、使用する糸およびその糸による編み方について検討する。

電磁波等を防護するためには、次の一般式が妥当する。

例えば、周波数を ν 、波長を λ とすると、 $\nu \cdot \lambda = 3 \times 10^{10} \text{ cm/sec}$ が成り立ち、いま、便宜的に携帯電話等が使用する周波数を($\nu = 1000 \text{ MHz}$)とすると、 $\lambda = 3 \text{ cm}$ であり、編み目の間隔が、 $\lambda/10$ 以下でなければ、シールドの効果が無いことを知りうる。

この結果から、高周波領域でのシールド特性を向上させるためには、①編み目を細くするか、②生地を厚みを大きくすることが重要なことが知りうる。

本願考案者は、上記の検討を下に、より細かな編み目であり、かつ、生地が厚くなる編み方を選定して、次のような本考案の一実施の形態を工夫するに至った。

【0010】

図1は、本考案の一実施の形態に係る電磁波防護肌着を形成する導電性糸1の

概略構成図である。

導電性糸1は、ポリエステルからなる芯糸2に、糸状の導電性物質3を螺旋状に巻き付けたもの（カバードヤーン）である。

上記の編み目の細かさおよび生地厚を考慮して、この実施の形態に使用する導電性糸1は、本実施の形態では、太さ30デニール（太さは、約100ミクロン）のものを、太さ30デニールのポリエステルの芯糸2の表面に、導電性物質として、銀の細線を螺旋状に巻き付けた構成のものである。

これは、銀の電気伝導度が非常に大きいため、受けた電磁波が、熱エネルギーに変換されることを利用するからである。

このような導電性糸1を使用することにより、出来上がる布地を比較的細かな編み目とすることができ、かつ、前記導電性物質3を前記芯糸2に螺旋状に巻き付けることにより、広い領域で電磁波を受けることができ、人体に植え込まれたペースメーカを人体ごとくろみこんで、電磁波からの高い防護効果を得られる構成とした。

なお、前記芯糸2は、ポリエステル糸の他に綿糸やナイロン糸等を用いてもよい。

【0011】

つぎに、図2は、前記導電性糸1を使用して作成したスムーズ編みによる電磁波遮断布4の網目構成図であり、このうち図2（a）は、スムーズ編みによる電磁波遮断布4の前面における網目構成図であり、図2（b）は、同電磁波遮断布4の断面における網目構成図である。

この電磁波遮断布4は、着心地および電磁波防護効果を考慮して、スムーズ編みによる編み地で編成し、伸縮性に富み、形状の安定性が高くなる構成とし、本実施の形態においては、この電磁波遮断布4は、ゲージ（1インチ間の針数）は、22G、表裏間Aは、0.6mmとして編成されている。

すなわち、スムーズ編みは、導電性糸1a、導電性糸1bからなり、これら2本の導電性糸1a、1bで1段目の網目が編成される。図2（a）に示すように、まず、導電性糸1aで表面側に裏面から表面にループ1a₁を作り、導電性糸1bで裏面側に表面から裏面にループ1b₁を形成するように編成する。つぎに、

導電性系1 aと導電性系1 bが交差して、導電性系1 bが前面に配置され、表面側に裏面側からループ1 b₂を作り、次いで、裏面に配置された導電性系1 aで裏面側に表面側からループ1 a₂を形成するように編成する。このように、導電性系1 aと導電性系1 bで表面側と裏面側に交互にループが形成されるように編成して、1段目の網目を編成する。

【0012】

つぎに、2段目は、前記1段目で作られた表面側のループ1 a₁に導電性系1 bを通して裏面から表面にループ1 b₃を作り、前記1段目で作られた裏面側のループ1 b₁に導電性系1 aを通して表面から裏面にループ1 a₃を作る。そして、導電性系1 bと導電性系1 aを交差して、導電性系1 aを表面側のループ1 b₂に裏面から表面に通してループ1 a₄を作り、導電性系1 bを裏面側のループ1 b₂に表面から裏面に通してループ1 b₄を作成する。

そして、繰り返して導電性系1 aと導電性系1 bを表面側と裏面側で交互にループを作り、所定幅で所定長編成して該電磁波遮断布4を作成する。

このように、本実施の形態に係る電磁波遮断布4は、いわゆるスムーズ編みにより編成したが、これは、2本の導電性系1からなる編み地が2重の厚さで構成され、単に平編みで形成される「メリヤス地」（または、「天竺編み」とも称される。）等に比して、肉厚の編み地を形成することができるため、この結果、電磁波を受けても電磁波の透過がなく、また、肉厚の編み生地故に、大きな電磁波減衰率を得ることができることとなる。

【0013】

そこで、本実施の形態に係る前記電磁波遮断布4の透過電磁波の減衰を測定した。

図3、図4は、本実施の形態に係る前記電磁波遮断布4に関し、前記電磁波遮断布4を携帯電話等で使用される周波数帯の800MHz、1.5GHzの周波数の電磁波が透過した場合に、どの程度の低減できるかを測定した結果を示したグラフである。

【0014】

図3において、横軸は、周波数100kHzから1GHzの周波数からなる測

定周波数値 (Hz) であり、縦軸は、電磁波減衰量 (dB) を示す。

前記電磁波遮断布 4 を配置しないときの電磁波量を、0 dB (基準量) として、該電磁波遮断布 4 を配置したときの電磁波量を測定すると、100 kHz から 100 MHz までは平均して、約マイナス 40 dB (10 MHz での測定値は、マイナス 39.70 dB) であり、200 MHz を越えたあたりから、徐々に電磁波量が増加し、600 MHz では、約マイナス 35 dB、1 GHz では、マイナス 30 dB を上回っている (1 GHz での測定値は、マイナス 29.10 dB)。

したがって、このような電磁波遮断布 4 を配置しない場合には、安全を考慮すると、およそ 22 cm の近接しか許容されないペースメーカーと携帯電話等の安全距離を、前記電磁波遮断布 4 を配置することで、電磁波を、基準量より、30 dB ないし 40 dB を減衰することができ、およそ 3.8 cm の近接距離を確保することができるようになる。

【0015】

また、1 GHz の周波数帯域の場合、基準量 0 dB を 100% としたとき、マイナス 30 dB の電磁波量は、 $-30 \text{ dB} = -(\sqrt{(20+20+20)}) \text{ dB}$ 、 $-30 \text{ dB} = (\sqrt{(1/10 \times 1/10 \times 1/10)})$ で算出され、 $-30 \text{ dB} \approx 0.0316 \approx 3.2 (\%)$ が得られ、電磁波量が、マイナス 30 dB のときの減衰率は、約 97% となる。したがって、上述の 22 cm の近接距離は、3.8 cm の近接距離を確保することができ、実用上の危険は、ほとんど無視できる程度の携帯電話等とペースメーカーとの接近距離を確保することができる。

【0016】

また、図 4 は、前記図 3 と同様に、電磁波遮断布 4 を配置したときの電磁波の減衰を示したグラフ (周波数 1 GHz から 2.5 GHz) であり、縦軸は、電磁波減衰量 (dB)、横軸は周波数値 (Hz) である。

この図 4 のグラフは、横軸の周波数を 1 GHz から開始し、2.5 GHz までを測定した。これは、前記携帯電話の周波数に 1.5 GHz が使用されていることを考慮して測定を行った。

この図 4 のグラフによると、1 GHz では、上記したように、マイナス 30 d

Bを上回る程度から始まり、1.7329GHzでは、マイナス20.85dBで最高となる。そして、周波数が高くなるにつれて、除々に電磁波量が減少し、2.5GHzでは、前記1GHzとほぼ同量のマイナス30dBを上回る程度となる。

上記同様、基準量0dBを100%としたとき、マイナス20dBの電磁波量は、マイナス20dB=1/10により、10%となり、該電磁波遮断布4の減衰率は、90%となる。この場合も上述するように、安全を考慮すると、およそ22cmの近接しか許容されないペースメーカーと携帯電話等の接近距離を、およそ7cm程度の近接距離があれば、一応の危険回避距離とすることができ、携帯電話等を使用する場合の実用上の安全性が向上するものとなる。

【0017】

つぎに、上述した第一の実施の形態の電磁波防護肌着の他の例として、第二の実施の形態について説明する。

本考案の電磁波防護肌着に係る第二の実施の形態は、ポリエステルからなる芯糸に、導電性物質をコーティングした導電性糸を使用する。

図5は、本第二の実施の形態に係る導電性糸13の概略構成図であり、図5中、2は、前記第一の実施の形態と同様の芯糸、14は、導電性物質である。

導電性糸13は、ポリエステルからなる芯糸2に、導電性物質14を厚さ0.3ミクロンでコーティングしたものである。

上記の編み目の細かさおよび生地厚を考慮して、この実施の形態に使用する導電性糸1は、上記第一の実施の形態と同様に、太さ30デニール（太さは、約100ミクロン）のものをを用い、この太さ30デニールのポリエステルの芯糸2の表面を、コーティング材として、ニッケル導電性物質14で覆ってなるものを使用した。これは、前記導電性物質14を前記芯糸2にコーティングすることにより、前記第一の実施の形態と同様に、該導電性糸13の電磁波を受ける表面積を大きくし、また、隣り合う導電性糸13間を電氣的に同電位にして、広い面積が確保され、人体に植え込まれたペースメーカーを人体ごとくみこんで、電磁波からの高い防護効果を得られる構成とした。

【0018】

つぎに、図6は、前記導電性糸13を使用して作成した電磁波遮断布15の網目構成図であり、このうち図6(a)は、電磁波遮断布15の前面における前記導電性糸13の配置を示した網目構成図であり、図6(b)は、電磁波遮断布15の断面における前記導電性糸13の配置を示した網目構成図である。

電磁波遮断布15は、1本の前記導電性糸13によりリブ編みで編成され、該遮断布15のゲージ(1インチ間の針数)は、22G、表裏間Bは、約0.5mmである。

この電磁波遮断布15は、着心地および電磁波防護効果を考慮して、1本の前記導電性糸13により、リブ編みによる編み地で編成され、該遮断布15のゲージ(1インチ間の針数)は、22G、表裏間Bは、約0.5mmである。

また、この電磁波遮断布15は、前記第一の実施の形態で使用した導電性糸1より電磁波を受ける表面積が大きいため、前記スムース編みよりも薄く、さらに伸縮性に富み、フィット感が高くなる構成とした。

すなわち、リブ編みは、1本の前記導電性糸13ので1段目の網目が編成される。図6(a)に示すように、まず、導電性糸13で裏面から表面にループ13₁を作り(いわゆる表編み)、つぎに導電性糸13で表面から裏面にループ13₂を形成(いわゆる裏編み)して編成する。ついで、導電性糸13裏面から表面にループ13₃を作り、そして裏面から表面にループ13₄を形成するように編成する。このように、導電性糸13で表面側からと裏面側からと交互にループが形成されるように編成して、1段目の網目を編成する。

【0019】

つぎに、2段目は、前記1段目で作られた1個目のループ13₁に導電性糸13を通して裏面から表面にループ13₅を作り、前記1段目で作られた2個目のループ13₂に導電性糸13を通して表面から裏面にループ13₆を作る。そして、導電性糸13をループ13₃に裏面から表面に通してループ13₇を作り、ついで導電性糸13を4個目のループ13₄に表面から裏面に通してループ13₈を作成する。そして、導電性糸13で、このような表編みと裏編みを繰り返し、所定幅で所定長編成すると該電磁波遮断布15となる。

このように、本第二の実施の形態に係る電磁波遮断布15は、リブ編みにより

編成したので、図6（b）に示すように、表編みと裏編みの組み合わせで、肉厚の編み地が形成される。

また、この電磁波遮断布15においても前記第一の実施の形態の電磁波遮断布4と同様に、電磁波を受けても電磁波の透過がなく、大きな電磁波減衰率が得られる。

【0020】

そこで、本第二の実施の形態に係る前記電磁波遮断布15においても、透過電磁波の減衰を測定した。

図7は、本第二の実施の形態に係る前記電磁波遮断布15に関し、携帯電話等で使用される周波数帯の電磁波が透過した場合に、どの程度の低減できるかを測定した結果を示したグラフである。

【0021】

図7において、横軸は、本第二の実施の形態では、周波数10kHzから1GHzの周波数からなる測定周波数値（Hz）であり、縦軸は、電磁波減衰率（dB）を示す。

前記電磁波遮断布15を配置しないときの電磁波量を、0dB（基準量）として、該電磁波遮断布15を配置したときの電磁波量を測定すると、10kHzから3MHzまでは平均して、約マイナス60dBであり、10MHzでは、約マイナス57.5dB、1GHzでは、マイナス20.9dBとなる。

したがって、上記第一の実施の形態と同様に、電磁波遮断布15を配置することで、基準量より、20dBないし50dBの電磁波を減衰することができ、およそ7cmの近接距離が確保される。

【0022】

つぎに、上記した電磁波遮断布4および電磁波遮断布15を用いて作成した電磁波防護肌着を、ペースメーカを植え込んだ人体が着用した様子を図8に基づいて説明する。

図8は、ペースメーカを植え込んだ人体が電磁波防護肌着5を着用した様子を示す説明図であり、6は、見頃、7は、袖、8は、見頃6の首部分に設けられたゴム編み部、9は、袖口に設けられたゴム編み部、10は、見頃6の裾部分に設

けられたゴム編み部である。また、11は、該電磁波防護肌着5を着用した人体であり、12は、前記人体11に植え込まれたペースメーカーである。

なお、本実施の形態では、心臓が人体11の左胸部にあるものとし、これに伴いペースメーカー12も人体11の左側（左脇腹）に配置されたものとして説明する。

【0023】

見頃6は、人体11の胴体部分のほぼ全体を覆い、この見頃6の両袖切り部分に袖7が設けられ、これは、電磁波が、人体11に植え込まれたペースメーカー12から22cm（電磁波の最低隔離距離）以内に入らないように考慮されている。

また、該電磁波防護肌着5の首部分、両袖口部分、裾部分には、それぞれゴム編み部8、9、10が設けられている。

首部分のゴム編み部8は、該電磁波防護肌着5の首部分が、人体11の首に隙間なくフィットさせるために設けられ、両袖口のゴム編み部9は、袖口が人体11の腕に隙間なくフィットさせるために設けられ、また、裾部分のゴム編み部10は、人体11の腰部分に隙間なくフィットさせるために設けられている。

この電磁波防護肌着5の首部分、袖口部分、裾部分が、人体11の首、腕、腰に隙間なくフィットしていれば、隙間から電磁波が入ることなく、7cm以下の距離をもってペースメーカー12を覆うことができる。

【0024】

この電磁波防護肌着5を着用することにより、人体11の近隣で発生した電磁波は、そのほとんどが遮断されて、少なくとも人体11に植え込まれたペースメーカー12が覆い包まれ、該ペースメーカー12を中心に最低7cm以下の接近距離を確保することができ、あらゆる角度で発せられる電磁波に対しても、実用上問題にならない程度の影響しか受けなくなるようにすることができる。

すなわち、電磁波が、電磁波防護肌着5に編み込まれた導電性物質3にあたると、電磁波は熱エネルギーに変換されて、90%以上が遮断され、実用上大幅に向上した携帯電話等とペースメーカーの接近距離を保つことができる。

【0025】

なお、上記第一の実施の形態では、2本の導電性糸で前記電磁波遮断布4を作成したが、所定の太さの綿糸と前記導電性糸を2本を1組として、2組の綿糸と前記導電性糸で電磁波遮断布を作成してもよい。

また、上記第一の実施の形態では、電磁波遮断布4を作成する場合に、2本の導電性糸1をスムーズ編みで形成、また、1本の導電性糸でリブ編みとしたが、電磁波減衰量が所定量減衰されればリバーシブル編み等でもよく、その編み方は特に限定されない。

【0026】

なお、本第二の実施の形態では、電磁波遮断布15をリブ編みとしたため、該電磁波遮断布15で作成した電磁波防護肌着5は、伸縮性が非常に高く、人体11にフィットするため、人体11に植え込まれたペースメーカ12が覆い包まれて、最低7cm以下の接近距離を確保することができ、特に、首部分に設けられたゴム編み部8、袖口に設けられたゴム編み部9、見頃6の裾部分に設けられたゴム編み部10を設けなくてもよい。

また、本第二の実施の形態では、芯糸2に導電性物質14をコーティングした導電性糸13を用い、電磁波を受ける表面積を大きくしたため、リブ編みによる電磁波遮断布15以外に、天竺編み等の電磁波遮断布としてもよい。

なお、上記実施の形態では、2本の導電性糸で電磁波防護肌着を編成して、人体へ植え込まれたペースメーカを電磁波から防護させたが、電磁波防護肌着の裏面に非金属性の繊維から成る裏地を張ってもよく、これにより、人体の皮膚に直接導電性糸が接触しないため、金属アレルギーを引き起こしたり、また、既に金属アレルギーの人も着用することができる。

【0027】

なお、上記実施の形態では、導電性糸に30デニールものを使用したか、所定の電磁波減衰率が得られれば、その太さは特に限定されない。

また、上記実施の形態では、導電性物質に銀を用いたが、電磁波を減衰できれば、銀に限定されない。

なお、上記実施の形態では、導電性糸は、芯糸に銀をコーティングして構成したが、芯糸に糸状の銀を螺旋状に巻き付けてもよく、また、芯糸を用いず、金属

糸のみで構成してもよい。

また、本実施の形態では、導電性糸をゲージ22Gで編み、電磁波防護肌着を形成したが、このゲージ数は、所定の電磁波減衰率が得られれば、特に限定されない。

なお、上記実施の形態では、電磁波防護肌着を丸首半袖のシャツ状に形成したが、袖は、長袖であってもよく、また、首周りをハイネック等にしてもよい。

また、上記実施の形態では、電磁波防護肌着として、上半身に着用する肌着を例に説明したが、人体に植え込まれたペースメーカーの位置に個人差があるため、下方からの電磁波に対しても防護できるように、下半身に着用するズボン下等の下着であってもよい。

【0028】

【考案の効果】

以上説明したように、本考案の電磁波防護肌着によると、電磁波防護肌着を着用することにより、人体に植え込まれたペースメーカーの電磁波による誤作動を、ほぼ完全に防止することができる。

また、本考案の電磁波防護肌着は、首周り、袖口、裾部分にゴム編み部を設けたため、人体に隙間なくフィットし、人体の前後左右からの電磁波の進入を防止できると共に、首周り、袖口等からの電磁波の進入を防止できる。

さらに、本考案の電磁波防護肌着は、洗い替え用に数枚所持していれば、その上に着用する衣類に左右されることなく、例えば、就業時には、今までと同様にスーツを着用し、休日には、スーツ以外のセーターやシャツ等を着用することができ、また、就寝時には、本考案の電磁波防護肌着の上にパジャマ等を着用することができる。

このように、該電磁波防護肌着を身につけているのみで、ペースメーカーが植え込まれた人体の近隣で発生する電磁波に特別注意を払う必要がなくなる。

すなわち、本考案の電磁波防護肌着を着用することで、1日中（ほぼ24時間）、四季を問わず、電磁波から、人体に植え込まれたペースメーカーを始めとする電子機器および人体を防護することができる。

Searching by Document Number

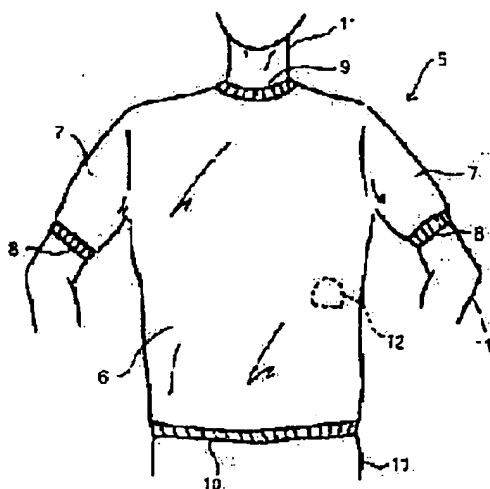
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Unexamined Publication of Patent,861-6351) (04,JP, Unexamined Publication of Patent,H03-206104) (04,JA, E.2623644) (04,JP,
Unexamined Publication of Utility Model,552-141402)[67,2000. 8.31.04] (04,JP, Unexamined Publication of Patent,H08-176962) (04,JP, Unexamined Publication of Patent,861-
6351) (04,JP, Unexamined Publication of Patent,H03-206104) (04,JA, E.2623644) (04,JP, Unexamined Publication of Utility Model,552-
141402)
Title of invention: Electromagnetic wave protection underwear

Abstract:

SUMMARY: Because den magnetic wave cutoff cloth is organized electromagnetic wave cutoff cloth is organized by interlock stitch clogged up of mesh in wall thickness or and a rib knits the electroconductivity thread which did coating with conductive material, and it appears in core thread, and is sewed the electroconductivity thread which wound conductive material of filament around a core net in a spiral, complete can approximately prevent malfunction by electromagnetic wave of a pacemaker planted by human organism.
(Machine Translation)



Other Drawings

Utility-model/ new registration document
3055556

[[Abstract\(made by the applicant\)](#)] [[Claims](#)] [[Drawing Description](#)] [[Detail Description](#)]

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(57)

[ABSTRACT]

[PROBLEM TO BE SOLVED]

The present invention takes warning by prevention of malfunction of a pacemaker of a heart planted in human organism, electromagnetic wave protection underwear intercepting electromagnetic wave to be incident on from every angle of human organism is provided.

[SOLUTION]

A rib knits electroconductivity thread 13 that coating did conductive material 3, and it appears to electromagnetic wave protection underwear 5 of the present invention organizes cloth 4 that electromagnetic wave intercepts electroconductivity thread 1 which wound conductive material 3 of filament around core thread 2 in the shape of helices by interlock stitch clogged up of mesh in wall thickness or core thread 2, and *den* magnetic wave cutoff cloth 15 is organized, when human organism 11 wore, planted pacemaker 12 covered, and seemed to be wrapped in human organism 11, and rib stitch division was comprised in opening, and decision sewed electromagnetic wave cutoff cloth 4, 15.

[CLAIM FOR THE UTILITY MODEL REGISTRATION]

[Claim 1]

Electromagnetic wave protection underwear; wherein; After having made electroconductivity thread of above the first of them and electroconductivity thread of above the second of them intersect to the making of, a countersunk head in the loop which went along the loop which went along two electroconductivity thread of the predetermined diameter that core thread was koteingusa in conductive material in face from rear in face side in electroconductivity thread of the first of them in rear from face in rear side in the making of, electroconductivity thread of the second of them on the way, appointed amplitude does making of, these with the first step in loop going along loop going in face from rear in face side in electroconductivity thread of above the second of them in rear from face in rear side in the making of, electroconductivity thread of above the first of them repeatedly , about column, it intersects in electroconductivity thread of above the first of them and electroconductivity thread of above the second of them to the making of, a countersunk head in loop in rear side through electroconductivity thread of above the first of them in rear from face in loop of electroconductivity thread of above the second of them in the making of, electroconductivity thread of above the first of them of the first step above in loop in face side through electroconductivity thread of above the second of them in face from rear in loop of electroconductivity thread of above the first of them in electroconductivity thread of above the second of them of the first step above next, and it sakuri in *rupu* in *hyomensoku* through *dodenseishi* of \$ zenki the second of them in *hyomen* from rear in loop of electroconductivity thread of above the first of them of the first step above in the making of, next in loop in face side through electroconductivity thread of the first of them in face from rear in loop of electroconductivity thread of the second of them of the first step above, it syoteifukukuriri in *kore*, and it henshi, and it kuriri to *syoteidanmoku* in the second step and shi, *kore*, and it henshi, and it hennarishi in *denjiha* *danfu, it yushi in *gomu hen mi bu* in *kaikuchibu*, and *sabakidan* hoseishi.

[Claim 2]

Electromagnetic wave protection underwear as claimed in said claim 1; wherein; Said electromagnetic wave cutoff cloth makes loop going along loop in rear from face in the making of, next in face with said

electroconductivity thread from rear , to a countersunk head, loop of rear is made in alteration from loop from these rear to face and face, appointed amplitude does these with the first step repeatedly, loop going along loop in rear from face in loop made from face of the first step above in the making of, next by rear in face from rear in loop made from rear of the first step above about column next by face is made, appointed amplitude does these with the second step repeatedly, this was repeated to appointed column scale division, and electromagnetic wave cutoff cloth was organized.

[Claim 3]

Said claim 1 or electromagnetic wave protection underwear as claimed in said claim 2; wherein; Rear land organized in metalloid-related fiber was stuck on rear of said electromagnetic wave protection underwear.

[Claim 4]

Said claim 1 or electromagnetic wave protection underwear as claimed in said claim 2; wherein; Electroconductivity thread forming said electromagnetic wave protection underwear, it is by above core thread and two final performances in conductive material of threadiness.

[Claim 5]

Said claim 1 or electromagnetic wave protection underwear as claimed in said claim 2; wherein; Electroconductivity thread forming said electromagnetic wave protection underwear winds up conductive material of threadiness in the shape of helices in said core thread, and it is.

[BRIEF DESCRIPTION OF DRAWINGS]

[FIG. 1]

It is the outline block diagram which showed assembling of electroconductivity thread concerning one detailed description of the preferred embodiment of the present invention.

[FIG. 2]

It is mesh block diagram of electromagnetic wave cutoff cloth forming electromagnetic wave protection underwear concerning one detailed description of the preferred embodiment of the present invention.

[FIG. 3]

It is the graph which expressed electromagnetic wave attenuation character of electromagnetic wave cutoff cloth concerning one detailed description of the preferred embodiment of the present invention (100kHz, 1GHz).

[FIG. 4]

It is the graph which expressed electromagnetic wave attenuation character of electromagnetic wave cutoff cloth concerning one detailed description of the preferred embodiment of the present invention (1GHz, 2.5MHz).

[FIG. 5]

It is the outline block diagram which showed assembling of electroconductivity thread concerning second detailed description of the preferred embodiment of the present invention.

[FIG. 6]

It is mesh block diagram of electromagnetic wave cutoff cloth forming electromagnetic wave protection underwear concerning second detailed description of the preferred embodiment of the present invention.

[FIG. 7]

It is the graph which expressed electromagnetic wave attenuation character of electromagnetic wave cutoff cloth concerning second detailed description of the preferred embodiment of the present invention.

[FIG. 8]

It is an explanatory drawing of the state that human organism wore electromagnetic wave protection underwear concerning detailed description of the preferred embodiment of the present invention.

[DENOTATION OF REFERENCE NUMERALS]

1, 13... electroconductivity thread 2... core thread 3, 14... conductive material 4, 15... electromagnetic wave cutoff cloth 5... electromagnetic wave protection underwear 6... in full bloom 7... sleeve Eight or nine, 10... rib stitch department 11... body 12... pacemakers

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[FIELD OF THE INVENTION]

The present invention intercepts electromagnetic wave occurring from electric appliances and, to human organism by electromagnetic wave The electromagnetic wave protection underwear which can prevent effect is related to.

[0002]

[PRIOR ART]

It is reported these days that electromagnetic wave from an electric appliance gives bad influence to human organism There is *rarete*. However, In the room where an electric appliance emitting such an electromagnetic wave lives, By way of example only, There are television, washer, cold storage, a microwave oven, fluorescent lamp, it is present age company When requirement is indispensable for life in a meeting, it grows. In addition, In much enterprise, OA apparatus is introduced, is emitted by this OA apparatus It is assumed that bad influence is given to *ru* electromagnetic wave and the human body, and it is pointed out. To a countersunk head, The locomotive communication apparatus which suddenly increased recently ("a cellular phone" is said as follows) † B † j Electromagnetic wave of considerable dosage is emitted a shell , in a hospital, it is a false product of drop device Application of a cellular phone is limited so that malfunction such as *do* and blackout, electronic devices of operation room occurs It is done.

[0003]

OA apparatus employs in particular recently such, to defend effect of electromagnetic wave It faces each other for people, and electromagnetic wave cutoff apron is developed, it is worn within operation of OA apparatus A thing is encouraged to. In addition, As cloth intercepting electromagnetic wave in high efficiency, rear land is developed, it is rear land of suit *to* is done, and it is employed. The super conductive fiber and poly that this rear land did a coating in silver around nylon lint It is the fabric which put ester fiber together, and the suit which installed this rear land is worn, and it *yosu* By a *ru* thing, electromagnetic wave from external is intercepted.

[0004]

[PROBLEM TO BE SOLVED BY THE INVENTION]

However, Electromagnetic wave cutoff apron and the electromagnetic wave cutoff rear land which seem to have been mentioned above are taken and are belonging to Beam suit is developed as protection use of electromagnetic wave to healthy human organism. However, it is effect of electromagnetic wave to the human organism which planted a receiver, a pacemaker in heart problem If *ha* merely gives merely bad influence, it does not remain, malfunction of this pacemaker is attracted, and it is *ki* It goes, even

danger of life is anxious about in its turn. For example, such a pacemaker is center of a heart upon receipt of electromagnetic wave from external It is mistaken for wave length from chamber, and it is mistaken when a cardiac ventricle works smoothly. The *ketsu* Though actually *ka* is function imperfection , by misconception of a pacemaker, it is a heart temporarily *no* function stops, dizziness and a heartbeat are caused.

[0005]

In addition, With aging in modern times, operation coefficient of a senior citizen is *pe* highly, too There are a lot of people who begin work with having planted a maker. In such case, A lap As for ini, OA apparatus is disposed , in the neighborhood, a cellular phone is employed , in addition, it is *pesume* The principal which planted *ka* cannot but employ these OA apparatus and a cellular phone, and it is *na* There is *te*. This cellular phone application is dealt with, and it be assumed that bad influence is given to a pacemaker from a point, It is not put in chest pocket. In addition, About cellular phone application, it is the lowest from a pacemaker It is taught 22cm are separated, and to employ, but, it is the principal which planted a pacemaker There is not *ga* method to protect except that it is careful, and, for example, the next person is *kei* in a crowded train When electrification talk is employed, the electromagnetic wave is *mon* to affect a pacemaker A title occurs.

[0006]

In addition, The person who planted this pacemaker is a note in action of a pacemaker regularly And a record is done, and generation time of battery of a pacemaker is measured and and it is accepted to the letter of illness, setting It is had to adjust. Then, It is *pesume* to do by means of magnet It cannot be made the mechanism which completely intercepted mosquito in itself from electromagnetic wave. To a countersunk head, A recent pacemaker is small and light, and battery life is long with from 5 to 15, too Is planted in human organism, and is employed, such a pacemaker, the most The programmable type that a change of program is possible by floating field from external This pacemaker is wrong upon receipt of electromagnetic wave (noise) so that it is used and A problem to change program occurred.

[0007]

In there, Prevention of malfunction of a pacemaker of the heart that the present invention was planted in human organism It is similar, and *kagami* is watched, it is *hisage* in electromagnetic wave protection underwear intercepting electromagnetic wave to be incident on from every angle of human organism It was aimed at ing.

[0008]

[MEANS TO SOLVE THE PROBLEM]

Core thread is conductive material, and an invention concerning application concerned claim 1 is *ko* in electromagnetic wave protection underwear With two electroconductivity thread of a teingusa predetermined diameter, it is electroconductivity thread of the first of them, in the face side, rear A loop formation running a *ra* face is made, it is *ru* going in rear from face in rear side in electroconductivity thread of the second of them *pu* is made , even more particularly, it is *ko* in electroconductivity thread of the first of them and electroconductivity thread of the second of them on the way After having made shine, loop going in face from rear in the face side is made with electroconductivity thread of the second of them Loop going in rear from face in the rear side is made with electroconductivity thread of the first of them, these Predetermined amplitude is assumed the first step repeatedly , about column, it is *do* of the first step the second of them next It is electroconductivity thread of the second of them in face from rear in loop of electroconductivity thread of the first of them in *den*-related thread *o* is maintained, and loop is made in the face side, it is two above in electroconductivity thread of the first step the first of them Through electroconductivity thread of the first of them in loop of electroconductivity thread of scale division from face in rear, in rear side Loop is made , even more particularly, it intersects in

electroconductivity thread of the first of them and electroconductivity thread of the second of them It is electroconductivity thread of the first of them in face from rear in te, loop of electroconductivity thread of the first step the second of them *o* is maintained, and loop is made in the face side, it is *ru* of electroconductivity thread of the first step the first of them in next Loop is made in the face side through electroconductivity thread of the second of them in face from rear in *pu*, it is *ko* Predetermined amplitude assumes *re* the second step repeatedly, electromagnetic wave intercepts this to predetermined column scale division repeatedly Cloth is organized, it is characterized by that rib stitch department is provided in opening, and decision sewed. In addition, In electromagnetic wave protection underwear as claimed in claim 1 an invention concerning application concerned claim 2 It is, and, as for the electromagnetic wave cutoff cloth, the making of pours loop in face from rear in the electroconductivity thread A loop formation going through a rear face is made from *ni* face, to a countersunk head, loop from these rear to face Loop of rear is made from face alternately, appointed amplitude does these with the first step repeatedly, it is next When it is similar, and it danni, and it is accompanied, in loop made from rear of the first step by face, from rear, in face Loop is made, it is flesh side from face in the loop which was made from the first step face by rear to pour A loop formation going through a face is made, appointed amplitude does these with the second step repeatedly, it is appointed column scale division in this It is just, it is characteristic of that a reel is returned, and electromagnetic wave cutoff cloth was organized. To a countersunk head, An invention concerning application concerned claim 3 describes to claim 1 or claim 2 In *no* electromagnetic wave protection underwear, it is edition in fiber metalloid-related in rear of the electromagnetic wave protection underwear It is characteristic of that made rear land was stuck. And, An invention concerning application concerned claim 4 describes to claim 1 or claim 2 The electroconductivity thread which forms the electromagnetic wave protection underwear in *no* electromagnetic wave protection underwear, of threadiness It is characterized in in becoming the core thread by two final performances in conductive material. In addition, To claim 1 an invention concerning application concerned claim 5 or claim 2, of description In electromagnetic wave protection underwear, electroconductivity thread forming the electromagnetic wave protection underwear is *do* of threadiness It is characterized by that the core net is bound with *den*-related material in a spiral, and it is.

[0009]

[MODE FOR CARRYING OUT THE INVENTION]

As follows, About one detailed description of the preferred embodiment of electromagnetic wave protection underwear concerning the present invention, referring to drawing It is explained in detail. In a beginning, Employing thread and knitting by the net are examined. The next nitramine holds good to protect electromagnetic wave. By way of example only, When upsilon, wave length are assumed λ in frequency, it is $\text{upsilon} / \lambda = 3 \times 10^{10}$ cm/sec *ga* constitution, the frequency which cellular phones employ for facilities now (upsilon =1000 MH) If then it is $\lambda = 3\text{cm}$, and distance of stitch is not less than $\lambda / 10$ with *z*), It can be known that screening is ineffective. From the result, to improve screening character in high frequency territory, Stitch Is *o* thinned? It can be known that it is important that thickness of base metal is increased. It is the stitch which a scholar of the device stops in the analysis below, and is small, and and it is *atsu* of base metal If *mi* chooses thickening knitting, and one detailed description of the preferred embodiment of the following present invention is devised It was reached.

[0010]

Of electroconductivity thread 1 that FIG. 1 forms electromagnetic wave protection underwear concerning one detailed description of the preferred embodiment of the present invention It is outline block diagram. Electroconductivity thread 1 is spiral with conductive material 3 of threadiness to core

thread 2 comprising of polyester It is the person whom it is similar, and it kanki, and was followed (jacket terrible yarns). In consideration of fineness of the stitch and base metal *atsu*, it is *do* employing in this detailed description of the preferred embodiment *den*-related thread 1 is this detailed description of the preferred embodiment, 30 thickness denier (about 100 micron thickness) By means of a thing of), in the surface of core thread 2 of polyester of 30 thickness denier, it is electroconductivity thing It is a thing of the architecture which filament of silver was wound around as quality in a spiral. Because, this, electric conductivity of silver is very big, popular electromagnetic wave is thermal energy The reason is because that it is similar, and it is hen*sa is used. Is it comparatively *sai* in the fabric which is completed by employing such electroconductivity thread 1? Stitch and it can be done and conductive material 3 are wound up in the shape of helices to core thread 2 Electromagnetic wave can be received in a large region by keeping, was planted by human organism *kamae* that it is got a high protection effect from electromagnetic wave in similar medium *n* that a person will taiyo a pacemaker It was assumed *nari*. In addition, Even if core thread 2 uses cotton yarn or nylon yarn other than polyester yarn, it is *yo i*. [0011]

Electromagnetic by the interlock stitch that FIG. 2 was made using electroconductivity thread 1 in next It is mesh block diagram of wave cutoff cloth 4, and, of these, FIG. 2 (a) is *den* by interlock stitch It is mesh block diagram in front of magnetic wave cutoff cloth 4, and FIG. 2 (b) is electromagnetic wave cutoff cloth It is mesh block diagram in four cross section. This electromagnetic wave cutoff cloth 4 considers an arrival at feeling and electromagnetic wave protection effect, and it is interlock stitch It gets together to watch, it is knit, and it is organized in the ground, it is full of elastic property, soundness of configuration does with assembling becoming high, it is book In detailed description of the preferred embodiment, this electromagnetic wave cutoff cloth 4, gage (a number of stitch between 1 inch) 22G, A between the front and back are organized for 0.6mm. In other words, Interlock stitch is these 2 from electroconductivity thread 1a, electroconductivity thread 1b The first step mesh is organized in *doden* thread 1a of book, 1b. As shown in FIG. 2 (a), At first, Loop 1a₁ is made with electroconductivity thread 1a in face from rear in the face side, it is electroconductivity thread 1 Loop 1b₁ seems to be formed in rear from face in the rear side in b, and it is organized. In next, Electroconductivity thread 1b intersects electroconductivity thread 1a, and electroconductivity thread 1b is disposed to the fore, it is face Loop 1b₂ is made from the rear side in side, in electroconductivity thread 1a which subsequently is disposed by rear It is organized to form loop 1a₂ from the face side in the rear side. As thus described, *doden* Loop seems to be formed in the face side and rear side in sex thread 1a and electroconductivity thread 1b by alteration, and it is edition It is made, and the first step mesh is organized. [0012]

In next, the second step is electroconductivity thread 1 to loop 1a₁ of the face side made with the first step Loop 1b₃ is made from rear in face through b, of the rear side made with the first step Loop 1a₃ is made from face in rear through electroconductivity thread 1a to loop 1b₁. *soshi* te, electroconductivity thread 1b are intersected in electroconductivity thread 1a, and it is loop 1 of face side in electroconductivity thread 1a It is put through a face from rear to b₂, and loop 1a₄ is made, it is roux of rear side in electroconductivity thread 1b It is put through a rear face from face to *pu* 1b₂, and loop 1b₄ is made. And, It is *ru* in alteration in the face side and rear side in electroconductivity thread 1a and electroconductivity thread 1b repeatedly *pu* is made, a predetermined long piece is made in predetermined amplitude, and electromagnetic wave cutoff cloth 4 is made. As thus described, Electromagnetic wave cutoff cloth 4 concerning this detailed description of the preferred embodiment, for so-called interlock stitch It was organized more, but, this, comprising of two electroconductivity

thread 1, it is knit, and a ground is assembling in double caliper "The knitted fabrics which it leave, and is formed in merely knit fabric (even if or calico is watched", syo sa) *reru*). In comparison with *to*, of wall thickness , as a result, it is *den* it is knit, and to be able to form the ground A magnetic wave is taken, and there is not penetration of electromagnetic wave either , in addition,, of wall thickness, it is knit, and, in a base metal reason, it is big electromagnetic wave Damping factor can be got.

[0013]

In there, Attenuation of penetration electromagnetic wave of electromagnetic wave cutoff cloth 4 concerning this detailed description of the preferred embodiment is measured *ta*. FIG. 3, FIG. 4 are electromagnetic wave * about electromagnetic wave cutoff cloth 4 concerning this detailed description of the preferred embodiment 800MHz of a frequency band used *dan* cloth 4 for with cellular phones, cycle of 1.5GHz When numerical electromagnetic wave transmitted, how much effect that measured whether it could be reduced was shown It is graph.

[0014]

In FIG. 3, axis of abscissa is * comprising of frequency of 1GHz from frequency 100kHz The axis of ordinate which is *tei* frequency figure (Hz) shows electromagnetic wave attenuation (dB). Quantity of electromagnetic wave when electromagnetic wave cutoff cloth 4 is not disposed, as 0dB (basis) When quantity of electromagnetic wave when electromagnetic wave cutoff cloth 4 was disposed is measured, from 100kHz It is averaged to 100MHz and, about -40 dB (measured value at 10MHz) From an area ahead of 200MHz that are minus 39.70dB), it is *den* to *jo* Quantity of magnetic wave increases , at 600MHz, it is Mai at about -35 dB, 1GHz Eggplant 30dB is exceeded (29.10dB that measured value at 1GHz subtracts)). Therefore, When such electromagnetic wave cutoff cloth 4 is not disposed, safety is koryosu Such as a pacemaker and a cellular phone permitted only *ru* and about 22cm proximity, it is lower In electromagnetic wave, it is 30 than basis by disposing electromagnetic wave cutoff cloth 4 in all distance It can damp in dB - 40dB, about 3.8cm proximity distance is got It gets possible to be done.

[0015]

In addition, When, for the case frequency band of 1GHz, basis 0dB was assumed 100%, it is *ma* Electromagnetic wave dosage of Ina 30dB is -30dB = - ($\frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}$) dB -30dB = (it is calculated in $\frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}$), -30dB) 0.0316 $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ 3.2 (%) are provided, quantity of electromagnetic wave -30, at the time of dB *no* damping factor becomes about 97%. Therefore, Proximity distance 3. of 22cm, Proximity distance of 8cm can be got, most of the danger in practical use can be ignored Cellular phones of degree and access distance with a pacemaker can be got.

[0016]

In addition, Of electromagnetic wave when cloth 4 that FIG. 4 intercepted electromagnetic wave same as FIG. 3 was disposed The axis of ordinate which is the graph which showed attenuation (frequency 1GHz, 2.5GHz) is electromagnetic Quantity of wave attenuation (dB), axis of abscissa are frequency figure (Hz). Graph of this FIG. 4 starts frequency of axis of abscissa from 1GHz, to 2.5GHz *o* was measured. *ko* that 1.5GHz are employed as for this by frequency of the cellular phone It measured in consideration of *to*. -30 d which was mentioned above at 1GHz according to the graph of this FIG. 4 Degree exceeding B is begun with , at 1.7329GHz, it is minus 20.85dB It attends, and the amount of *ito* is become. And, As a frequency becomes high, quantity of electromagnetic wave decreases to *jo*, 1GHz at 2.5GHz and the degree which almost exceed -30 dB of the same amount It grows. When similar, basis 0dB were assumed 100%, it is quantity of electromagnetic wave of -20 dB By ha, -20 dB = $\frac{1}{10}$, it is 10% or decrease of electromagnetic wave cutoff cloth 4 *otoroe* rate becomes 90%. For this case, when safety is considered to state above, quite A pacemaker and access distance of cellular phones which are permitted only proximity of 22cm If there is proximity distance of other place around 7cm, it can be assumed tentative dangerous evasion distance, it is *kei* The person whom safety in practical use when

electrification talks are employed improves is become.

[0017]

As electromagnetic wave protection underwear example of detailed description of the preferred embodiment of the first in next, of the second Detailed description of the preferred embodiment is explained. Second detailed description of the preferred embodiment concerning electromagnetic wave protection underwear of the present invention is a core comprising of polyester The electroconductivity thread which did coating of conductive material is used for thread. FIG. 5 is outline block diagram of electroconductivity thread 13 concerning this second detailed description of the preferred embodiment, out of FIG. 5 2, core thread same as detailed description of the preferred embodiment of the first, 14 are conductive material. Electroconductivity thread 13 is caliper 0. with conductive material 14 to core thread 2 comprising of polyester Coating was done at 3 micron. In consideration of fineness of the stitch and base metal *atsu*, it is *do* employing in this detailed description of the preferred embodiment Same as detailed description of the preferred embodiment of the first *den*-related thread 1, 30 thickness denier (about 1 thickness) By means of a thing of 00 micron), of core thread 2 of polyester of these 30 thickness denier It is *shi* with the thing that face is covered with nickel conductive material 14 as coating material, and it is Business was done. This, coating does conductive material 14 to core thread 2, especially The surface area which catches electromagnetic wave of electroconductivity thread 13 same as *ri*, the first detailed description of the preferred embodiment It is increased and electroconductivity thread 13 ken next to each other are done in the electric potential electrically and, wide acreage Is found , in similar medium *n* that a person will taiyo a pacemaker planted by human organism, is it electromagnetic wave? A high protection effect of *ra* was done with provided assembling.

[0018]

Net of electromagnetic wave cutoff cloth 15 that FIG. 6 was made using electroconductivity thread 13 in next It is scale division block diagram, and, of these, FIG. 6 (a) is the above in front of electromagnetic wave cutoff cloth 15 It is the mesh block diagram which showed allocation of electroconductivity thread 13, and FIG. 6 (b) is electromagnetic wave cutoff cloth 1 It is the mesh block diagram which an arrangement of electroconductivity thread 13 in five cross section was shown in. Electromagnetic wave cutoff cloth 15 knits a rib by one *doden* thread 13, and is organized *de*, it is *gai** Gage of *dan* cloth 15 (a number of stitch between 1 inch), 22G, B about 0.5mm between the front and back, There is *de*. This electromagnetic wave cutoff cloth 15 considers an arrival at feeling and electromagnetic wave protection effect and, before nothing It gets together to knit a rib by note electroconductivity thread 13, it is knit, and is organized in the ground, it is *ge* of cutoff cloth 15 Di(a number of stitch between 1 inch) 22G, B between the front and back are about 0.5mm. In addition, Electroconductivity thread 1 that this electromagnetic wave cutoff cloth 15 employed in the first detailed description of the preferred embodiment Because surface area catching electromagnetic wave is bigger, it is thinner than the interlock stitch, to a countersunk head It is full of elastic property, a feeling of fitting assumed the architecture which became high. In other words, The first step mesh is organized in a *thing* of one electroconductivity thread 13 knitting a rib *ru*. At first, as shown in FIG. 6 (a), it is electroconductivity thread 13, from rear, in face, 13< loop S U B> </ S U B> ₁ is made (so-called stockinette stitch), it is electroconductivity thread 13 to pour, from face, in rear, 13< loop S U B> </ S U B> Formation (so-called back stockinette) is done of ₂, and it is organized. It is just face from 13 electroconductivity thread rear It is edition *ni* loop 13 ₃ is made and and loop 13 ₄ seems to be formed in face from rear It narisuru. As thus described, With electroconductivity thread 13, from the face side, from the rear side, alternately, loop It is organized so that it is formed, and the first step mesh is organized.

[0019]

In next, the second step is electroconductivity thread 1 to loop 13₁ of the first made with the first step Loop 13₅ is made from rear in face through 3, of the second made with the first step Loop 13₆ is made from face in rear through electroconductivity thread 13 to loop 13₂. *soshi* te, electroconductivity thread 13 are maintained in face from rear to loop 13₃, and loop 13₇ is made, Electroconductivity thread 13 is put through a rear face from face to loop 13₄ of the fourth carelessly and, 13< loop S U B> </ S U B>₈ is made. And, With electroconductivity thread 13, such a stockinette stitch and back stockinette are repeated When it is organized, it is to electromagnetic wave cutoff cloth 15 predetermined chief in predetermined amplitude. As thus described, Electromagnetic wave cutoff cloth 15 concerning this second detailed description of the preferred embodiment depends to knit a rib Because it was organized , as shown in FIG. 6 (b), it is wall thickness in a stockinette stitch and combination of back stockinette *no* is knit, and the ground is formed. In addition, It is electromagnetic wave cutoff cloth of the first detailed description of the preferred embodiment in this electromagnetic wave cutoff cloth 15 Electromagnetic wave is received, and, same as 4, there is not penetration of electromagnetic wave either, and big electromagnetic wave damping factor is advantageous *reru*.

[0020]

In there, In electromagnetic wave cutoff cloth 15 concerning this second detailed description of the preferred embodiment, it is penetration *den* Attenuation of a magnetic wave was measured. FIG. 7, about electromagnetic wave cutoff cloth 15 concerning this second detailed description of the preferred embodiment, cellular phones When it appeared, and electromagnetic wave of a *shi* use frequency band to be considered to be transmitted, of how much, it is * whether it can be reduced It is the graph which showed the result which *teishi*.

[0021]

In FIG. 7, axis of abscissa is 1G from frequency 10kHz in this second detailed description of the preferred embodiment The axis of ordinate which is determination frequency figure comprising of frequency of Hz (Hz), electromagnetic wave damping factor (d) B) is shown. With quantity of electromagnetic wave when electromagnetic wave cutoff cloth 15 is not disposed, it is 0dB (basis) and *shi* When quantity of electromagnetic wave when *te*, electromagnetic wave cutoff cloth 15 were disposed is measured, 10kHz It is about -60 dB, and it is about *ma* at 10MHz to *ra* 3MHz on an average At Ina 57.5dB, 1GHz, minus 20.9dB is become. Therefore, *ko* which disposes electromagnetic wave cutoff cloth 15 same as the first detailed description of the preferred embodiment In *to*, it can damp with 20dB - an electromagnetic wave of 50dB than basis Proximity distance of other place 7cm is got.

[0022]

Electromagnetic wave cutoff cloth 4 mentioned above in next and *den* which electromagnetic wave cutoff cloth 15 was used, and was made It is group *zui* in FIG. 8 with the state that the human organism which planted a pacemaker wore magnetic wave protection underwear *te* is explained. The state that the human organism that FIG. 8 planted a pacemaker wore electromagnetic wave protection underwear 5 It was an explanatory drawing to show, and, as for 6, in full bloom, 7 comprised sleeve, 8 to a neck section of in full bloom 6 Rib stitch department, rib stitch department that 9 was installed in the cuffs, 10 are * in skirt division of in full bloom 6 It is rejected rib stitch department. In addition, The human organism that 11 wore electromagnetic wave protection underwear 5 There is *de*, 12 is a pacemaker planted to human organism 11. In addition, In this detailed description of the preferred embodiment, a heart assumes a thing in the left chest of human organism 11, it is an attendant in this It is assumed that it is disposed by left side of human organism 11 (the left side), and *i* pacemaker 12 *setsumeisu ru*.

[0023]

In full bloom 6, for a body member of human organism 11, it is almost bonnet, both sleeves scooping

out division of this in full bloom 6 with the whole *ni* sleeve 7 is comprised, it is pacemaker 1 that electromagnetic wave was planted to human organism 11 as for this It does not seem to enter within 22cm (minimum insulation distance of electromagnetic wave), and it is considered from 2 † B In addition, In the neck section of electromagnetic wave protection underwear 5, both sleeves orifice division, skirt division, it is each gum It is knit, and department eight or nine, 10 are comprised. A neck section of underwear 5 that rib stitch department 8 for neck portion protects the electromagnetic wave is a chance to a neck of human organism 11 It is installed to make fit without an interval, rib stitch region 9 of both sleeves orifice, the cuffs are human organism 1 It is installed to make fit one arm without airspace and rib stitch department 1 of skirt division 0 comprises to make fit hips of human organism 11 without airspace. A neck section of this electromagnetic wave protection underwear 5, cuffs division, skirt division are a neck of human organism 11, arm, waists If it is fitted without *ni* airspace, without electromagnetic wave entering at a gap, of less than 7cm Pacemaker 12 can be covered with *no* distance. [0024]

The electromagnetic which occurred in neighborhood of human organism 11 by wearing this electromagnetic wave protection underwear 5 As for the wave, the most are intercepted, and it is *pesume* planted to human organism 11 at least It is covered, and *ka* 12 is given, it is access distance of less than or equal to minimum 7cm mainly on pacemaker 12 *o* can be got, for electromagnetic wave emitted in every angle, it is practical use *jomon* Only effect of the degree which a title does not have can get possible to be popular. In other words, Electromagnetic wave is conductive material 3 that it is knit to electromagnetic wave protection underwear 5, and it was crowded to, electromagnetic wave are converted into thermal energy, and more than 90% are intercepted, it is large in practical use Cellular phones and access distance of a pacemaker which improved can be kept. [0025]

In addition, In detailed description of the preferred embodiment of the first, it is a product with electromagnetic wave cutoff cloth 4 in two electroconductivity thread It was made, but, cotton yarn of predetermined thickness and the electroconductivity thread, two of them, as a lot, two sets of cotton yarn Electromagnetic wave cutoff cloth may be made in the electroconductivity thread. In addition, When, in the first detailed description of the preferred embodiment, electromagnetic wave cutoff cloth 4 is made, of 2 A rib was knit with formation and one electroconductivity net by interlock stitch, and *to* did electroconductivity thread 1, but, If is damped specified quantity electromagnetic wave attenuation, reversible is knit, equal, but it is preferable, the knitting It is not limited in particular. [0026]

In addition, Because a rib was knit, and, in this second detailed description of the preferred embodiment, *to* did electromagnetic wave cutoff cloth 15, it is *gai* And, as for electromagnetic wave protection underwear 5 made with electromagnetic wave cutoff cloth 15, elastic property is high in emergency human organism 1 Pacemaker 12 planted to human organism 11 wraps up, and it is surrounded to fit 1 *te*, access distance of less than or equal to minimum 7cm can be got, is comprised in particular a neck section *ta* rib stitch department 8, rib stitch department 9 installed in the cuffs, skirt division of in full bloom 6 were installed in Rib stitch department 10 needs not to be made. In addition, In this second detailed description of the preferred embodiment, coating did conductive material 14 to core thread 2 By means of electroconductivity thread 13, because the surface area which caught electromagnetic wave was increased, it depends to knit a rib It is knit, and, aside from electromagnetic wave cutoff cloth 15, calico is preferable as electromagnetic wave cutoff cloth of *to*. In addition, In detailed description of the preferred embodiment, electromagnetic wave protection underwear is organized in two electroconductivity thread, and it is a person It made protect a pacemaker planted to body from electromagnetic wave, but, it is flesh side of electromagnetic wave protection underwear Lining comprising of metalloid-related fiber may be put on a face, by this, it is *choku* in skin of human

organism Because a *setsu* electroconductivity net does not touch, an allergy to metal is caused , in addition, it is already gold A person of group allergy can be worn, too.

[0027]

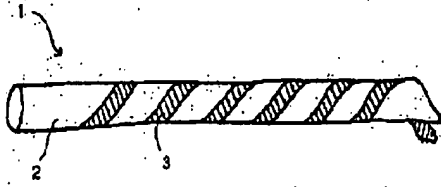
In addition, In detailed description of the preferred embodiment, 30 denier things were used for electroconductivity thread, but, it is appointed If *no* electromagnetic wave damping factor is provided, the thickness is not limited in particular. In addition, In detailed description of the preferred embodiment, silver was used in conductive material, but, cut electromagnetic wave in attenuation It is not limited to *ba*, silver. In addition, In detailed description of the preferred embodiment, as for the electroconductivity thread, coating does silver in core thread, and it is composed Silver of threadiness may be wound around a core net in a spiral and *ta* does not use core thread, it is metal It may be composed only in thread. In addition, In this detailed description of the preferred embodiment, an electroconductivity net is edited in gage 22G, electromagnetic wave protection underwear It was formed, but, if the electromagnetic wave damping factor that the number of this gage is predetermined is provided, is limited in particular There is not. In addition, In detailed description of the preferred embodiment, electromagnetic wave protection underwear was formed in the shape of a shirt of round neck short sleeves But it may be long sleeves and a wing may make the neck circumference high necks. In addition, Underwear to wear to the upper part of a person's body as electromagnetic wave protection underwear in detailed description of the preferred embodiment It was explained in example, but, so that lay of a pacemaker planted by human organism includes differences between individuals, Of drawers to wear to a lower part of the body which can be protected for electromagnetic wave from the lower part It may be underwear.

[0028]

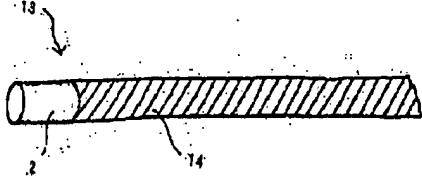
[EFFECT OF THE INVENTION]

As discussed above, According to the electromagnetic wave protection underwear of the present invention, it is arrival at in electromagnetic wave protection underwear Malfunction by electromagnetic wave of a pacemaker planted in human organism by doing business, It can be approximately completely prevented. In addition, Electromagnetic wave protection underwear of the present invention establishes rib stitch department in the neck circumference, the cuffs, skirt division Close, and human organism is fitted without airspace, an approach of electromagnetic wave from all around of human organism is prevented It is possible, and an approach of electromagnetic wave from the neck circumference, the cuffs can be prevented. To a countersunk head, If electromagnetic wave protection underwear of the present invention is washed, and several pieces are possessed for substitutes, of *so* For example, it is similar at the time of operation until now without it being controlled by clothing to wear on the top Suit is worn, wearing a sweater aside from suit or a shirt in holiday It is possible and pajamas are worn on electromagnetic wave protection underwear of the present invention at the time of going to bed Things are had. As thus described, The electromagnetic wave protection underwear is worn, and a pacemaker is set It is not had to pay caution to electromagnetic wave occurring in neighborhood of crowded human organism especially. In other words, In wearing electromagnetic wave protection underwear of the present invention, all day (for about 24 hours) Without distinction of), the four seasons, a pacemaker planted from electromagnetic wave by human organism is assumed the beginning Electronic devices and the human body can be protected.

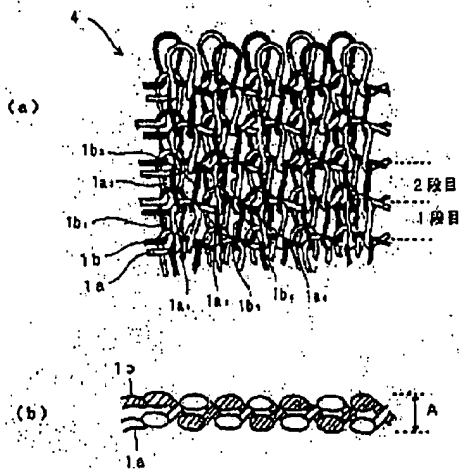
(fig.1)



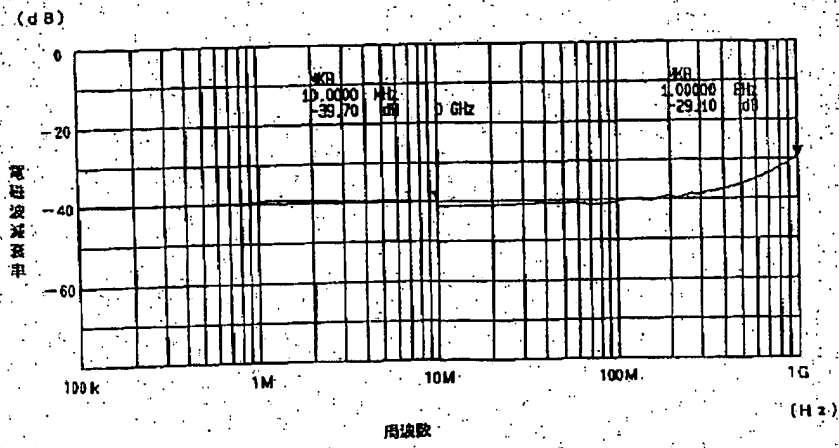
(fig.5)



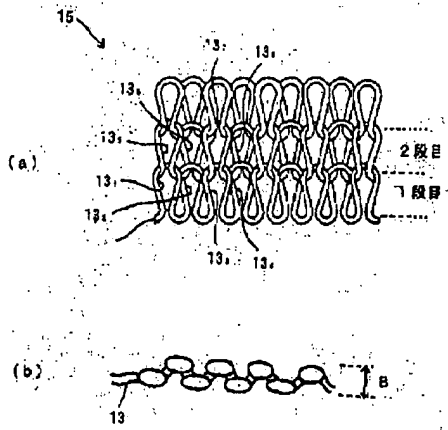
(fig.2)



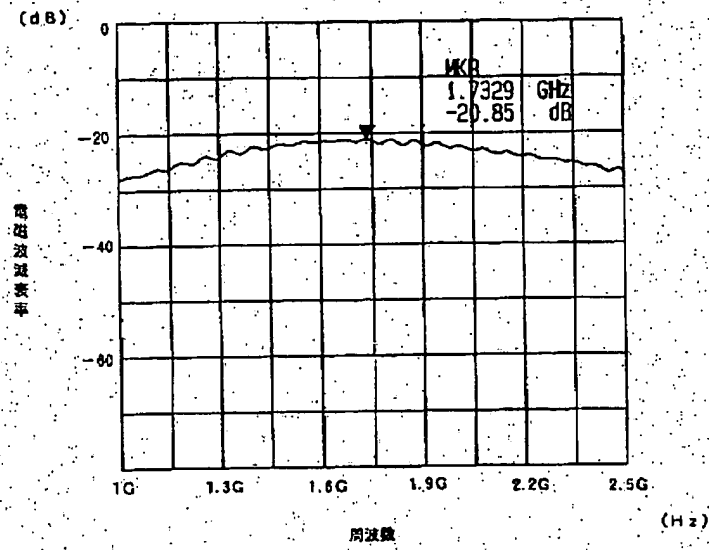
(fig.3)



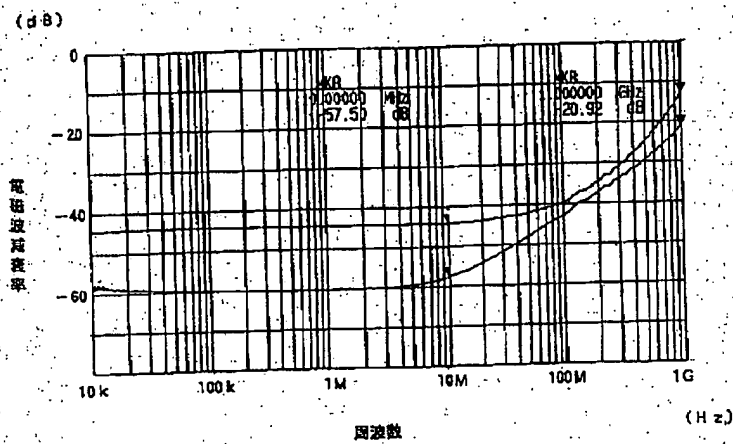
(fig.6)



(fig.4)



(fig.7)



(fig.8)

